MAQUET
GETINGE GROUP

COATING SYSTEMS
BIOLINE COATING

CARDIOVASCULAR

BIOLINE COATING
MIMICKING HUMAN TISSUE
MAQUET – THE GOLD STANDARD

MAQUET is an international synonym for innovative and technological advances in operating rooms and intensive care units. MAQUET offer state-of-the-art quality products and services for the optimal treatment of patients and the best working conditions. MAQUET Cardiovascular has extensive experience in open and beating heart surgery, demonstrating its commitment with continuous innovation. Its product portfolio includes the entire range of perfusion systems, catheters and cannulae, as well as extracorporeal life support systems.

Contact of blood with foreign surfaces during extracorporeal circulation activates numerous cellular regulatory mechanisms and plasma cascade systems. Extracorporeal circulation systems unavoidably expose blood to extensive contact with various foreign materials. An appropriate coating system can minimize the deleterious effects of these contact activation mechanisms.

BIOLINE Coating ensures a homogenous surface and minimizes the blood damaging effects of foreign surfaces. It provides high biocompatibility and contributes to the high viability of blood cells coming into contact with all components of an extracorporeal circuit – tip to tip.

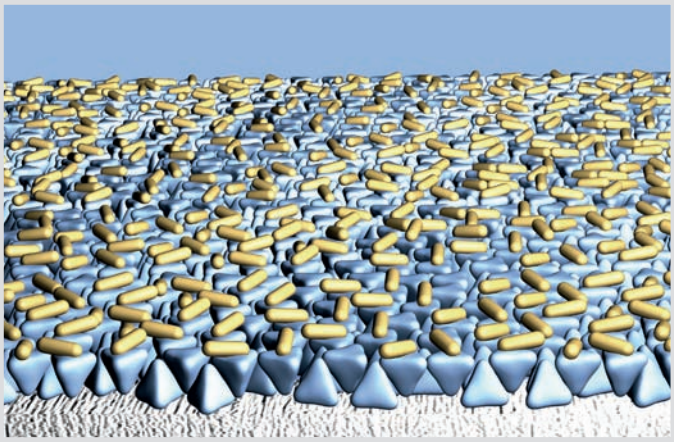
MAQUET – The Gold Standard.

IMPROVED HEMOCOMPATIBILITY
INCREASES SAFETY

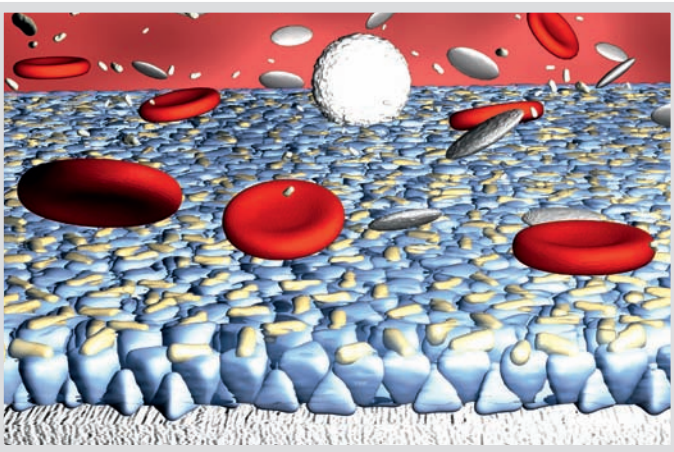
BIOLINE Coating combines albumin and heparin.
Covalent bonds between heparin molecules and the albumin layer guarantee exceptional stability of the coating. BIOLINE Coating ensures a homogenous surface that demonstrates preserved platelet function and a reduction in clotting activity, thrombus formation, and decreased activation of the complement system [1,2]. BIOLINE provides optimal biocompatibility of all components in contact with blood.

How it works:

- BIOLINE Coating makes the surface more hydrophilic and homogenous, thus preventing cell and protein adsorption with all their negative effects [3,4].
- BIOLINE Coating securely binds to a wide variety of different materials, resulting in blood contact with only one material surface.
- Developed specially for use in extracorporeal systems, complete sets can be treated optimizing overall biocompatibility of all blood contact components.



BIOLINE coated gas exchange membrane before coming into contact with blood.



BIOLINE coated gas exchange membrane adsorbs hydrophilic fluids out of the blood, causing the coating layer to swell and thus creating a homogenous surface.

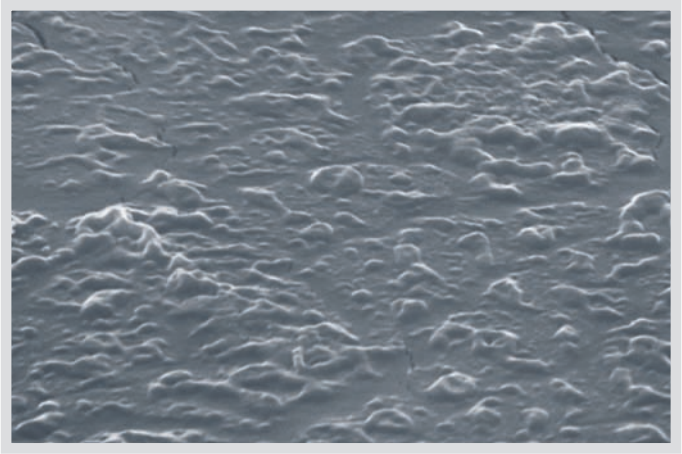
References:
(1) Wendel: Report of Results; Hemocompatitbility Evaluation of QuadroxD Bioline in comparison to QuadroxD Safeline in an in vitro Heart-Lung machine model, Clinic for Thoracic, Cardiac and Vascular Surgery, Eberhard-Karls University Tuebingen, Germany, 2007 (Data on file).
(2) Wendel: Report of Results; Hemocompatitbility Evaluation, Clinic for Thoracic, Cardiac and Vascular Surgery, Eberhard-Karls University Tuebingen, Germany, 2005 (Data on file).
(3) Brash JL et al: Dependence of Albumin-Fibrinogen Simple and Competitive Adsorption on Surface Properties of Biomaterials; Journal of Polymer Science 1979: Polymer Symposium 66, 377–389.
(4) Chuang HY et al: Interaction of Plasma Proteins with Artificial Surfaces: Protein Adsorption Isotherms; Journal of Laboratory and Clinical Medicine 1979; 92(3): 483–496.
(5) R. Feyrer et al: Bioline or Safeline Treatment of CPB Circuits? Cardiovascular Engineering 2003, 8, 79–84.
(6) H.P. Wendel et al: Oxygenator Thrombosis: Worst Case After Development of an Abnormal Pressure Gradient – Incidence and Pathway; Perfusion 2001, 16, 271–278.

OUTSTANDING PERFORMANCE
PUBLISHED EVIDENCE

MAQUET has a successful history of providing hemocompatible coatings for extracorporeal circulation systems. BIOLINE Coating is one of the most established coatings on the market and has an extensive body of published evidence.

Clinical benefits of BIOLINE Coating:

- Reduced clotting activity (TAT III and Prothrombin F 1.2) [8]
- Reduction of platelet adhesion and of thrombi creation [9, 11]
- Reduced cerebral damage [9, 10]
- Less complement activation [7, 10]
- Decreased neutrophil activation [10]
- Reduced inflammation [7, 11, 12]
- Reduced fibrinolytic activity [11]
- Complement factor C3 recovers better after 24 hours [5]
- Less occurrence of abnormal high pressure gradients on oxygenator [6, 13]



Uncoated inner surface of PVC tubing (5000 x magnified)

BIOLINE coated inner surface of PVC tubing (5000 x magnified)

(7) G. Wimmer-Greinecker et al: Synthetic Protein Treated Versus Heparin Coated Cardiopulmonary Bypass Surfaces: Similar Clinical Results and Minor Biochemical Differences; European Journal of Cardio-thoracic Surgery 1999, 15, 1 – 7.

(8) Fraedrich et al: A New Covalent Heparin Bonding Process of Extracorporeal Circuits Improves the Hemocompatibility of Cardiopulmonary Bypass Equipments; Clinical study presented at the 23rd Congress of the German Society for Thoracic and Cardiovascular Surgery, Germany 1995.

(9) Feyrer et al: Reduction of Neuropsychological Dysfunction after Cardiac Surgery with Heparin-coated Cardiopulmonary Bypass Circuits; Kardiotechnik 01/1998.

(10) Matheis et al: Heparin Coated Cardiopulmonary Bypass is Associated with Reduced Pulmonary and Cerebral Injury; Thorac Cardiovasc Surg 1996; 44 (Abstract).

(11) Palatianos et al: A Prospective, Double Blind Study on the Efficacy of the Bioline Surface Heparinized Extracorporeal Perfusion Circuit; Ann Thorac Surg 2003; 76: 129 – 35.

(12) Harig et al: Reducing the Post-Pump Syndrome by Using Heparin-Coated Circuits, Steroids, or Aprotinin, Thorac. Cardiovasc. Surg. 47, 1999, 111 – 118.

(13) Whaba et al: Heparin-Coated Equipment Reduces the risk of Oxygenator Failure, Ann Thorac Surg 1998; 65: 1310 – 2.

For local contact:
Please visit our website
www.maquet.com

MAQUET
GETINGE GROUP

MAQUET Cardiopulmonary AG
Hechinger Straße 38
72145 Hirrlingen, Germany
Phone: +49 (0) 7478 921-0
Fax: +49 (0) 7478 921-100
info@maquet-cp.com
www.maquet.com

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